

Find the derivative of each function. Show steps with proper notation.

1. $f(x) = \sin(x^2)$	2. $f(x) = \sqrt[3]{x^2 + 3x - 4}$
3. $f(x) = \sec(5x)$	4. $g(x) = \sin^2 x$ recall: $\sin^2 x = (\sin x)^2$ a) Find $g'(x)$  b) Find $g''(x)$
5. $f(x) = \left(\frac{3x^2 - 2}{2x + 3}\right)^3$	
6. $f(x) = x^3 \cos(\pi x)$	7. $f(x) = x^5 (2x - 1)^7$ *write answer in factored form.

8. Find the value of $a$ and $b$ if $f(x) = ax^3 - bx^2$ if $f(1) = -8$ and $f'(2) = 0$ .
9. If $f(x) = x^2 - 4$ and $g$ is a differentiable function of $x$ , what is the derivative of $y = f(g(x))$ ? (A) $2g(x)$ (B) $2g'(x)$ (C) $2xg'(x)$ (D) $2g(x)g'(x)$ (E) $2g(x) - 4$

10. Numerical Values and Derivative Rules: Use the values in the table to find the derivative at the indicated  $x$  value.

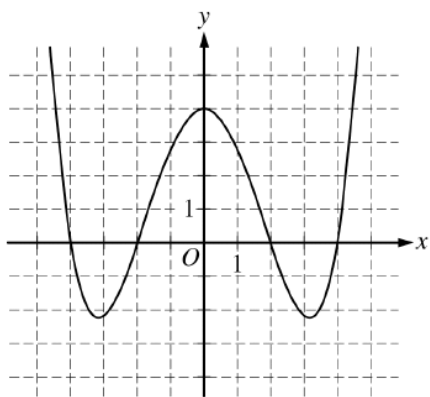
$x$	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
2	3	-4	5	1
-1	0	2	-3	6

a)  $y = x^3 \cdot f(x)$  at  $x = 2$

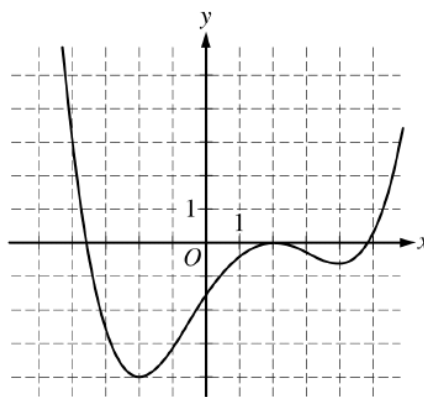
b)  $y = f(g(x))$  at  $x = -1$

11. Find the equation of the line tangent to  $f(x) = \tan(2x)$  at  $x = \frac{\pi}{6}$ .

12.



Graph of  $f$



Graph of  $g$

The graphs of the differentiable functions  $f$  and  $g$  are shown above. If the function  $p$  is defined by  $p(x) = f(x)g(x)$ , which of the following must be true about  $p'$ , the derivative of  $p$ ?

- (A)  $p'(-2) < 0$
- (B)  $p'(-2) = 0$
- (C)  $p'(-2) > 0$
- (D)  $p'(0) < 0$
- (E)  $p'(0) = 0$